Status of the IPDF interface

Providing Photon PDFs for the generic Likelihood reconstruction

- IPDF's Goals and Purpose
- new redesigned IPDF interface
- Status and plans for the future

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Purpose and scope

Goal: Substantial improvement of the reconstruction accuracy of AMANDA/IceCube

1st step: review of the underlying likelihood description

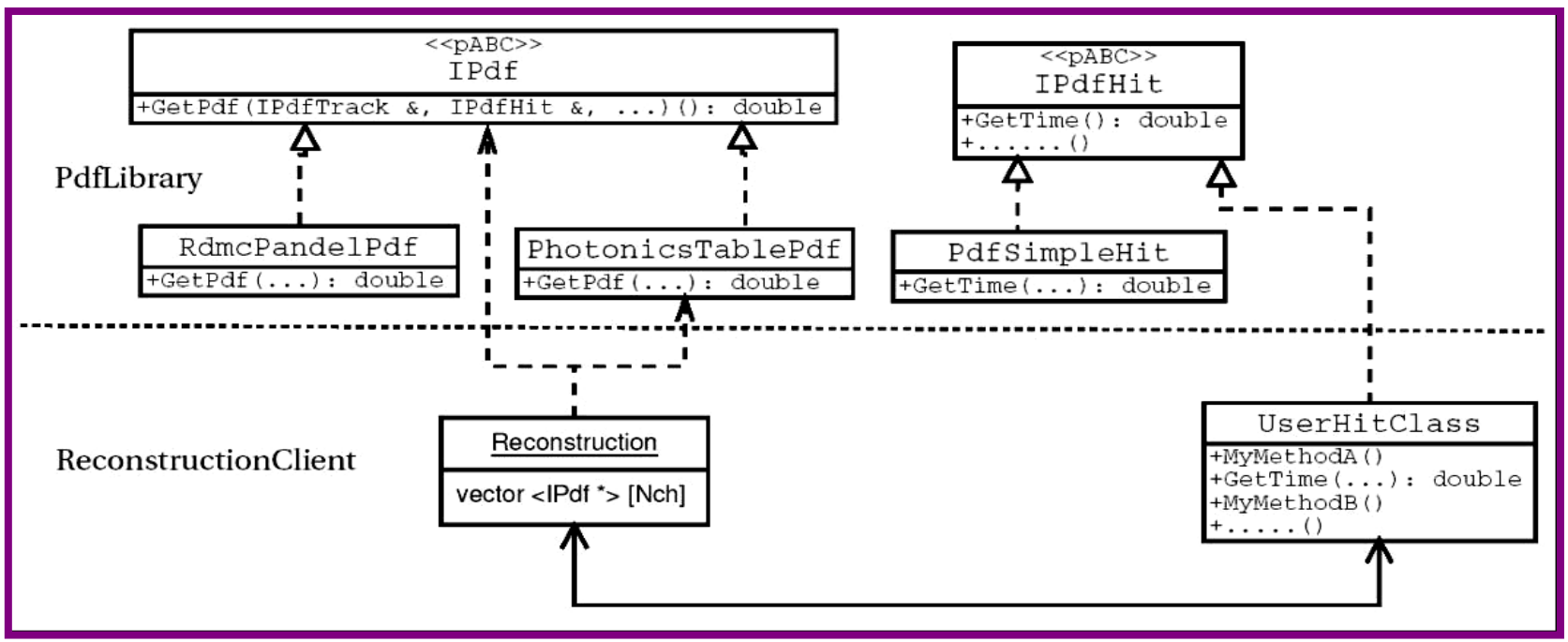
-> Development of an flexible and extendable interface to the likelihood description of the arrival time and number of photons

Current paradigm: All (time-) likelihoods can be constructed if the probability density function is known for a single photon.

Aim is not to develop another reconstruction program but rather to deliver a standarized Interface to photon PDFs which can be used by a reconstruction program.

"Old" PDF

Original interface PDF, (Proposed in Mons, presented at Bommerholz) is a pure virtual polymorphic interface.
It lives in the AMANDA CVS repository ($CVSROOT/PDF)



"Old" PDF status

- All rdmc functions are implemented and tested
- Additional functions, e.g. convoluted pandel etc. are added
- Implemented in sieglinde

Pure virtual polymorphic interface is simple and easy to use but has severe design problems, (realized in Uppsala by John, David and us)

- Blurred distinction between likelihood and pdf (hit/channel loop)
- Incompatible "modes" cause run-time errors, difficult to diagnose
- SetLikeMode() and similar methods are imposed on classes implementing IPdfFunc

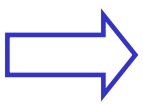
⇒ We decided to redesign the interface for the use in IceCube

The PDF package is implemented and fully usable. The status is frozen but we continue support.

Everybody who is tempted to use rdmc for Pandel functions should use this package.

Goals of the new ipdf interface

- Factorize likelihood into separate components:
  - Single/multi-photon PDF
  - Likelihood function
- Easy to swap and compare different methods
- Efficient and fast implementation
- Automated production/use of tabulated PDFs
- Easy to implement a new PDF or Likelihood
- ROOT GUI and interface for analysis
- Directly integrated into IceCube framework but seperatable



Generic templated approach
for details see Simons talk at Maryland

ipdf Status

Version 0.1 (integrated into IceCube build system) is available from Glacier:

cvs -d glacier…cvsroot-dev co ipdf

Provides most RDMC functionality (except for some patched likelihoods) and a small root GUI for quickly plotting

Preliminary documentation see:

astro.uni-wuppertal.de/~robbins/ipdf.html

This page also provides the doxygen generated documentation

Examples: make all-tests-run

Try the tutorial, demonstration how you can add your own PDF

Next Steps

1. Finish design of the interface:
   We think a review of the interface for its usability in IceCube reconstruction would be very useful
   - Is this the right concept for an interface to IceRec?
   - What should be changed ?
   - What additional features are wished ?

- Code clean-up the next weeks (when Simon is back from Argentinia)
- Implement full "old pdf/rdmc" functionality
- Expand GUI and interactive usage from root
- Interface to Photonics/PTD and tabulated pdfs
- Extension to new Likelihoods (e.g. PNK)
- Try it to reconstruct tracks